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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/564,049	01/09/2006	Paul Royston Harvey	PHNL030776US	7270

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CLEVELAND, OH 44143

EXAMINER

VAUGHN, MEGANN E

ART UNIT PAPER NUMBER

2859

DATE MAILED: 10/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/564,049	Applicant(s) HARVEY, PAUL ROYSTON	
	Examiner Megann E. Vaughn	Art Unit 2859	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 January 2006.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 09 January 2006 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date <u>1/9/2006</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Drawings

1. The drawings are objected to because in **figure 3, 306 and figure 4, 410, the equation for Δf has an extra unexplained Δf on the right side of the equation, which is essentially saying that the phase difference divided by $2\pi TE$ is equal to zero.** Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Specification

Art Unit: 2859

2. The disclosure is objected to because of the following informalities: **page 5 and 6 have the abbreviation TR, Examiner assumes that TR refers to Time to Repetition, please clarify.**

Appropriate correction is required.

Claim Objections

3. Claims 11-14 are objected to because of the following informalities:

The use of a "computer program product," in the preamble of claim 11 is confusing. Examiner assumes claim 11 is disclosing a digital storage medium comprising a computer program. The suggested wording when disclosing a computer program to is the following, "a computer readable storage medium having stored thereon a computer program comprising instruction which when executed by a computer causes the computer to...." Appropriate correction is required.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 1, 3-5, 10-12, and 15-17 are rejected under 35 U.S.C. 102(b) as being anticipated by Zhang et al (US 5652514).

Regarding claim 1, Zhang et al discloses in figure 2, a method of monitoring a magnetic field drift of a magnetic resonance imaging apparatus (column 3, lines 11-13; column 8, claim 6, lines 1-3), the method comprising the steps of:

- performing a first data acquisition by a first magnetic resonance signal being caused by a first excitation (Tx; column 4, lines 2-4; column 8, claim 6, step 1),

- determining a first phase of the first magnetic resonance signal an echo time (TE) after the first excitation (column 5, lines 51-52, equation 7; column 9, claims 7-8),

- performing a second data acquisition by a second magnetic resonance signal a time interval (TR) after the first data acquisition, the second magnetic resonance signal being caused by a second excitation (column 4, lines 11-12; column 8, claim 6, steps 1-3),

- determining a second phase of the second magnetic resonance signal the echo time after the second excitation (column 5, lines 51-52, equation 7; column 9, claims 7-8),

- determining a shift of a resonance frequency based on a difference of the first and second phases (column 5, lines 55-56, equation 8; column 8, claim 6, step 4).

Regarding claim 3, Zhang et al discloses that the first and second data acquisitions are performed by means of a gradient echo sequence method (column 7, lines 28-29).

Regarding claim 4, Zhang et al discloses that k-space is scanned and second data acquisitions are performed intermittently to determine second phases in order to continuously monitor the shift of the resonance frequency (column 5, lines 14-17).

Regarding claim 5, Zhang et al discloses in figure 2, that the second data acquisitions are performed after fixed time intervals (TR) (column 4, lines 4-5).

Regarding claim 10, Zhang et al discloses performing a Fourier transformation of the first and second magnetic resonance signals and determining the first and second phases in the frequency domain (column 9, claim 7, step 4B).

Regarding claim 11, Zhang et al discloses in figures 1 and 2, a computer (16) capable of:

determining a first phase of a first magnetic resonance signal, an echo time (TE) after a first excitation (Tx) (column 5, lines 51-52, equation 7; column 9, claims 7-8),

determining a second phase of a second magnetic resonance signal the echo time after a second excitation (Tx), whereby the second magnetic resonance signal is acquired a time interval (TR) after the first magnetic resonance signal (column 5, lines 51-52, equation 7; column 9, claims 7-8),

calculating a shift of a resonance frequency based on a difference of the first and second phases (column 5, lines 55-56, equation 8; column 8, claim 6, step 4).

Regarding claim 12, Zhang et al discloses means being adapted to continuously monitor the shift of the resonance frequency.

Regarding claim 15, Zhang et al discloses in figures 1 and 2, a magnetic resonance imaging apparatus comprising processing means (16) for determining a first phase of a first magnetic resonance signal an echo time (TE) after a first excitation (Tx), for determining a second phase of a second magnetic resonance signal the echo time after a second excitation, the second magnetic resonance signal being acquired a time interval after the first magnetic resonance signal, and for calculating a shift of a resonance frequency based on a difference of the first and second phases and the time interval.

Regarding claim 16, Zhang et al discloses in figure 1, display means (18) for displaying of the shift of the resonance frequency.

6. Claims 1, 2, and 8 are rejected under 35 U.S.C. 102(b) as being anticipated by Schaeffer et al (US 2002/0048340).

Regarding claim 1, Schaeffer et al discloses in figure 1, a method of monitoring a magnetic field drift of a magnetic resonance imaging apparatus (page 2, [0012]), the method comprising the steps of:

performing a first data acquisition by a first magnetic resonance signal being caused by a first excitation (1),

determining a first phase of the first magnetic resonance signal an echo time after the first excitation (page 2, [0027]),

performing a second data acquisition by a second magnetic resonance signal a time interval after the first data acquisition, the second magnetic resonance signal being caused by a second excitation (2),

determining a second phase of the second magnetic resonance signal the echo time after the second excitation (page 2, [0027]),

determining a shift of a resonance frequency based on a difference of the first and second phases (page 2, [0027]).

Regarding claim 2, Schaeffer et al that the first and second data acquisition are performed using a signal shot EPI method (Abstract, claim 7).

Regarding claim 8, Schaeffer et al discloses comparing the shift of the resonance frequency to a threshold value and compensating the magnetic field drift if the threshold value is surpassed (page 2, [0015]).

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 6, 7, 9, 13, 14, 17, and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zhang et al (US 5652514) in view of Yao et al (4885542).

Regarding claims 6, 13, and 17, Zhang et al discloses the method, computer program, and MRI apparatus for monitoring a magnetic drift as stated above in

paragraph 5 above. Zhang et al does not disclose that the magnetic field drift is compensated by changing the frequency of the excitation in accordance with the shift of the resonance frequency.

Yao et al discloses a MRI apparatus for compensating frequency/phase shifts comprising a method and means (figure 1, 24) to compensate the magnetic field drift by adjusting the RF excitation/transmitter frequency in accordance with the shift of the resonance frequency (Abstract, column 4, lines 6-15). Therefore it would have been obvious to a person having ordinary skill in the art at the time that the invention was made to adjust the RF excitation frequency as taught by Yao et al to compensate for the shift of the resonance frequency disclosed by Zhang et al in order to reset the RF frequency for subsequent NMR measurements cycles and therefore being able to compensate for changes during the NMR data measuring process.

Regarding claims 7, 14, and 18, Zhang et al discloses the method, computer program, and MRI apparatus for monitoring a magnetic drift as stated above in paragraph 5 above. Zhang et al does not disclose that the magnetic field drift is compensated by adjusting the magnetic field in accordance with the shift of the resonance frequency.

Yao et al discloses a MRI apparatus for compensating frequency/phase shifts comprising a method and means (figure 1, 24) to compensate the magnetic field drift by adjusting the magnetic field in accordance with the shift of the resonance frequency (column 7, line 62- column 8, line 4; column 16, claims 7-8; column 17, claims 23-24).

Therefore, it would have been obvious to a person having ordinary skill in the art at the time that the invention was made to adjust the magnetic field as taught by Yao et al to compensate for the shift of the resonance frequency disclosed by Zhang et al in order to reset the magnetic field for subsequent NMR measurements cycles and therefore being able to compensate for changes during the NMR data measuring process.

Regarding claim 9, Zhang et al discloses a method for monitoring a magnetic drift of an MRI apparatus as stated above in paragraph 5. Zhang et al does not disclose specifically that the phases are determined in the time domain.

Yao et al discloses that the phases are determined in the time domain or the frequency domain (column 4, lines 15-20). Therefore it would have been obvious to a person having ordinary skill in the art at the time that the invention was made to determine the first and second phases disclosed by Zhang et al in the time domain as taught by Yao et al in order to calculate the phase differences with respect to time.

Conclusion

9. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Maier et al (US 5151656) discloses a correction of NMR data acquired by an echo-planar technique.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Megann E. Vaughn whose telephone number is 571-272-8927. The examiner can normally be reached on 8 am- 5 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Diego Gutierrez can be reached on 571-272-2245. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.



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